ECRONICON OPEN ACCESS

EC CLINICAL AND MEDICAL CASE REPORTS
Research Article

Anesthetic Protection of Endoscopic Ligation of Esophagus Varicose Veins

Tarasov AN[1]*, Shilov V Yu[2], Olevskaya ER[3] and Levit AL[4]

[1]*Professor of the Department of Hospital Surgery, South Ural State Medical University, Chelyabinsk, Russia*

[2]*Doctor of the Department of Anesthesiology and Resuscitation No. 1 of the State Budgetary Healthcare Institution of the ChOKB, Russia*

[3]*Professor of the Department of Hospital Surgery, Head of the Department of Endoscopy, Chelyabinsk Regional Clinical Hospital, Chief Endoscopist of the Chelyabinsk Region, Chelyabinsk, Russia*

[4]*Honored Doctor of the Russian Federation, MD Professor, Head of the Department of Anesthesiology and Resuscitation of the State Budgetary Healthcare Institution SOKB No. 1, Yekaterinburg, Chief Anesthesiologist-Resuscitator of the Ural Federal District and the Ministry of Health of the Sverdlovsk Region, Russia*

***Corresponding Author:** Tarasov AN, Professor of the Department of Hospital Surgery, South Ural State Medical University, Chelyabinsk, Russia.

Received: May 30, 2023; **Published:** June 16, 2023

Abstract

The clinical experience of the results of using various options for anesthetic support of endoscopic ligation of esophageal varices in 153 patients with liver cirrhosis (Child-Pugh class B and C) is summarized. Perioperative combined monitoring of arterial and venous pressure in varixes, determined using the original method of endoscopic balloon manometry, allowed us to optimize the choice of drugs and increase the efficiency and safety of endoscopic ligation by performing RASS 1-3 analgosedation and reduce the total number of complications.

Keywords: *Monitored Sedation; Endoscopic Ligation and Manometry; Esophageal Varices*

Introduction

Portal hypertension occurs in 90% of patients with cirrhosis of the liver, often accompanied by varicose veins of the esophagus (EVV) and stomach, which is complicated by the development of bleeding in 30% of them [3]. Mortality after the first episode of bleeding reaches 30 - 50%, with recurrence - 70% [6]. In the modern complex of measures for the prevention and control of bleeding, one of the effective components is endoscopic ligation (EL). Increased varix pressure increases the risk of perioperative bleeding due to ligated varix rupture or ligature slippage [1]. This can presumably be reduced by lowering blood pressure and esophageal pressure. Criteria for safe arterial hypotension and the effect of this indicator on the value of portal pressure require clarification.

Purpose of the Study

Optimization of the anesthetic protection of endoligation to reduce the risk of perioperative bleeding in patients with portal hypertension.

Materials and Methods

This cohort, open, controlled, two-stage, parallel, single-center study was performed in the surgical and endoscopic departments of the Chelyabinsk Regional Clinical Hospital, the clinical base of the South Ural State Medical University in 2016 - 2018. The study was performed in 153 patients with portal hypertension due to cirrhosis of the liver with the threat or ongoing bleeding from the esophagus, who underwent ES of the esophagus. Sample: probabilistic random. There were 83 (54.2%) men, 70 (45.8%) women, the patients' age was 50.8 ± 3.0 years. The inclusion criteria were met by patients with liver cirrhosis of any etiology with symptoms of liver failure class B - 114 (74.2%), class C - 39 (25.8%) according to Child-Pugh, with the presence of EVV 2-3-4 degrees, which were performed EL, with a health index according to ASA 2 - 60 (39.2%), ASA 3 - 93 (60.8%) patients. Compensated comorbidity was diagnosed in 93 (60.8%) patients. The exclusion criteria included patients with liver cirrhosis in whom the severity of liver failure did not exceed class A according to Child-Pugh, with the presence of hepatocellular carcinoma, hepatorenal syndrome; spontaneous bacterial peritonitis. An analysis of the assessment of the impact of various types of anesthesia on the magnitude of arterial and portal pressure was carried out in the following groups of the study:

- Group 1 - Premedication in combination with local anesthesia (promedol 1 mg, relanium 10 mg, lidocaine 2% m/a) according to the recommendations of the Russian Society of Surgeons (ROX) for this operation - 12 patients (control group); analgosedation RASS = -3,
- Group 2 - With arterial normotension, ataralgesia was provided - (fentanyl 0.0015 μg/kg/min, Relanium 2.5 μg/kg/min, ketamine 12 μg/kg/min) 38 - patients,
- Group 3 - With initial arterial hypertension, sedation was used (propofol 200 - 250 mg/kg/min) - 51 patients,
- Group 4 - To achieve arterial and portal hypotension, 23 patients received nitroglycerin in addition to ataralgesia,
- Group 5 - 29 patients with a combination of arterial and portal hypertension, propofol was also supplemented with the introduction of nitroglycerin. In all patients, standard premedication was supplemented by intravenous administration of ondansetron 0.12 mg/kg and drotaverine hydrochloride 0.6 mg/kg 30 minutes before EL. The relationship between arterial and portal pressure was assessed in 5 groups of blood pressure, identified according to the WHO classification. BP up to 129 mm Hg. - 30, up to 139 mm Hg. 26, up to 159 mmHg 40, up to 179 mmHg 43, above 180 mm Hg. - 14. The initial pressure in the RVV was measured during diagnostic esophagogastroscopy. To do this, during endoscopic ultrasonography (EUS), a technique developed in the clinic was used. A probe with an ultrasonic sensor and a balloon were inserted into the esophagus. Water was pumped into the balloon with a syringe until the complete cessation of blood flow in the RVV, recorded by the EUS. The pressure in the balloon was measured with a Waldmann apparatus in mm of water column [4]. It was assumed that the pressure in the veins of the esophagus corresponds to the pressure measured in the balloon. After achieving analgosedation, a control measurement of pressure in the veins of the esophagus was performed. When persistent high portal hypertension was detected after achieving analgosedation in 52 patients, nitroglycerin 1.8 - 2.0 μg/kg/min was administered intravenously twice, with an exposure of 2 minutes. in a total dose not exceeding 250 mcg. After achieving arterial hypotension and reducing the pressure in the EVV, confirmed by the control measurement of venous pressure, microfluidic nitroglycerin was administered at a dose not exceeding 0.25 μg/kg/hour, after which EL was performed.

Statistics

Data processing was carried out according to the general principles of medical statistics [2], using the IBM SPSS Statistics v.21 program. The correlation of indicators and criteria for paired samples of measuring the main hemodynamic parameters at two points of measurement - initial and after drug exposure were calculated: systolic blood pressure (SAL), mean arterial pressure (MAP), venous pressure in the veins of the esophagus (AP) and heart rate (HR). With a normal distribution, the statistical significance of the difference (p) of quantitative values between groups was assessed using Student's t-test. For the analysis of dependences, the method of correlation

analysis was used with the calculation of the Spearman rank correlation coefficient rs. With correlation coefficients rs up to 0.29, the correlation was considered weak, rs from 0.3 to 0.69 - medium strength, rs from 0.7 and more - strong. To describe quantitative data having a normal distribution, the arithmetic mean (M) and the standard deviation of the arithmetic mean (s) were calculated. To describe qualitative indicators, frequencies and shares (in %) were calculated. To determine the significance of differences in independent groups, the Kruskal-Wallis test for multiple comparisons and the Mann-Whitney test for paired samples were used; for related samples, the McNemar test was used. Testing of statistical hypotheses was carried out at a critical significance level $p < 0.05$.

Results and Discussions

The performance of EL in the control group was accompanied by a significant increase in SBP and MAP, respectively, by 18% and 13%, IA by 7.8%. Heart rate also significantly increased by 13%. This, apparently, is a consequence of the influence of unresolved stress factors of endoscopic manipulation and characterizes the insufficient effectiveness of the used anesthetic protection. Diastolic pressure ($p < 0.123$) did not change significantly at the time of EVRT EL.

The formation of analgosedation (RASS = -3) achieved through the use of ataralgesia or propofol in 89 patients showed a significant decrease in SBP ($p < 0.0001$), MAP and diastolic pressure ($p < 0.0001$) and heart rate ($p < 0.001$). This was accompanied by a significant decrease in VD in RVVP ($p < 0.0001$). There are no significant differences between the results in the analyzed groups of patients. Clinical evaluation of the effectiveness of various options for anesthetic protection in comparison with the control group showed that it was possible to significantly reduce the number of perioperative bleeding, completely eliminated cardiac complications, anxiety, gag reflex and movement of patients during EL. In the majority of patients in the control group ($p < 0.002$), restlessness (RASS+1), motor reaction and gag reflex remained, which demonstrates the insufficient effectiveness of the anesthesia used. ECG changes represented by moderate cardiac arrhythmia were registered in 2 (16.7%) patients ($p < 0.166$) and did not pose a threat to life. Blood saturation ($p < 0.258$) also did not change significantly in all analyzed groups. Bleeding during EL was registered in 9 (75%) patients, including intensive bleeding in 2 of them, the volume of which exceeded 200.0 ml, which required the installation of a Blackmore probe. Excessive motor mobility of the patient and the esophagus significantly hampered the positioning of the endoligator. An additional hindrance to EL was bleeding, which made it difficult to visualize its source and other varixes.

The presented factors together significantly increased the duration of EL. During the first 48 hours, postoperative bleeding from EVV occurred in 4 (33.3%) patients. The use of both variants of analgosedation made it possible to significantly reduce the duration of the operation and the number of hemorrhages in the perioperative period in comparison with the control group.

For a retrospective assessment of the influence of the magnitude of portal hypertension, an analysis was made of the frequency of registration of bleeding in 40 patients who had undergone it before. The indicators of venous manometry, produced at various times after the bleeding, probably do not reflect the value of the VD directly at the time of bleeding. However, the presented data demonstrate a marked predominance of the incidence of hemorrhagic complications in patients with varix pressure exceeding 600 mm of water column. That allows you to use this indicator in predicting the risk of recurrent bleeding.

To date, measurement of VD is not a routine procedure. To determine the dependence of the diameter of the most dilated varix on the value of venous pressure in 97 patients, simultaneous USG measurements of these parameters were performed. Correlation analysis showed a strong positive relationship between the pressure in varix and its diameter. It was found that at venous pressure below 600 mm of water column, the vein diameter (7.78 mm) was significantly smaller than in patients with high venous pressure (9.16 mm). This makes it possible to assess the degree of risk of bleeding even without the use of USG manometry and also determines the indications for drug-induced pressure reduction. Despite the high clinical efficacy of analgesic sedation during EP of the EVV, a significant proportion of patients retained high or extremely high pressure in the EVV. This often made it difficult to apply the endoligature and increased the risk

of bleeding during or after EL. The presence of venous pressure exceeding 700 mm w.g. is, in our opinion, an absolute contraindication to the safe use of EL. This determined the need for the use of additional medication to reduce arterial and possibly venous pressure. To accomplish this task, nitroglycerin was chosen taking into account its known clinical effects. This drug is directly proportional to the dose provides a decrease in pressure in the portal vein and its collaterals. After achieving analgosedation, the control measurement of pressure in the varix > 600 mm in determined the indications for the use of nitroglycerin. After achieving analgosedation, the administration of nitroglycerin was accompanied by a significant additional decrease in SBP ($p < 0.0001$), MAP and diastolic blood pressure ($p < 0.0001$) and a decrease in heart rate ($p < 0.034$). Controlled arterial hypotension in all patients did not reach critical values, but was accompanied by a significant decrease in VD in EVTL ($p < 0.0001$). The combination of propofol and nitroglycerin was associated with a 22.5% reduction in systolic blood pressure and a 13.4% reduction in intraocular pressure, suggesting a limited indication for this combination in patients with high arterial and venous hypertension.

In the analyzed blood pressure groups, a significant decrease in blood pressure by 11.5 - 16.8% was registered immediately before the EL. This was accompanied by a significant decrease in pressure in the RVVP. At the same time, the conducted correlation analysis revealed the absence of a connection between the initial indicators of arterial and venous pressure and confirmed a strong correlation between a one-time decrease in these indicators achieved through the use of analgosedation by the proposed methods or in combination with the introduction of nitroglycerin.

The use of analgosedation has significantly reduced the incidence of perioperative bleeding. The additional use of nitroglycerin provided an additional reduction in the incidence of hemorrhagic complications, despite the fact that this combination of drugs was used in patients with the highest VD and, accordingly, the highest risk of bleeding. Excessive motor activity and retching were excluded in all patients, which provided optimal conditions for performing the operation and significantly reduced its duration compared to the control group.

Conclusion

The main factors complicating endoligation are high varix pressure and persistent hyperactivity of the esophagus, which can be eliminated by using adequate anesthetic protection aimed at reducing the patient's motor activity and reducing varix pressure. At the same time, severe arterial hypotension in patients with liver cirrhosis can contribute to the development of progressive cardiovascular or liver failure. This limits the use of propofol in patients with low blood pressure. The safe use of this anesthetic in combination with nitroglycerin is possible only in the presence of high blood pressure. The monitoring of hemodynamic parameters of arterial and venous pressure performed during the operation made it possible to identify parameters significant for EL. The risk of hemorrhagic complications depends on the pressure in the varix, which made it possible to form the following groups of patients with portal hypertension:

- Group 1 moderate risk - ID 460 - 600 mm ID. Art. - allows efficient ligation with minimal risk of spontaneous or perioperative bleeding.
- 2nd high risk group - VD above 600 mm id.st. - a high risk of spontaneous bleeding determines the indications for urgent ligation, and the risk of perioperative bleeding can be significantly reduced by inducing arterial and portal hypotension through analgosedation, and a persistently high VD determines the indications for additional administration of nitroglycerin.
- 3rd group of extremely high risk of spontaneous and perioperative bleeding - I.D. above 700 mm I.D. Art. - provides for the need for emergency therapeutic measures. The use of EL is possible only after a significant medical decrease in portal pressure. Ineffective hypotension precludes safe ligation and, for the prevention of hemorrhages, determines the indications for the formation of a porto-caval shunt.

The obtained data allowed us to optimize the anesthetic protection of EVEV EL.

The use of indicators of combined monitoring of arterial and venous pressure allows you to choose a rational method of anesthetic protection. An effective decrease in venous pressure determines the possibility of performing endoligation, and if there is no effect, it determines contraindications for this operation.

Bibliography

1. Gabriel SA., *et al*. "The effectiveness of endoscopic ligation of varicose veins of the esophagus". *Kuban Scientific Bulletin* 5.160 (2016): 19-25.
2. Glantz S. "Biomedical statistics". Moscow: Practice (1999): 459.
3. Zatevakhin II., *et al*. "Portal hypertension. Diagnosis and treatment". Practical guide. Moscow 138 (2015): 51-68.
4. AA Makhalov., *et al*. "Patent 2456913 Method for direct measurement of pressure in the veins of the esophagus" (2010).
5. VYu Shilov., *et al*. "Patent 2654778 Method for reducing pressure in varixes in portal hypertension during endoligation under anesthesia" (2016).
6. De Franchis R. "Expanding consensus in portal hypertension Report of the Baveno VI Consensus Workshop: Stratifying risk and individualizing care for portal hypertension". *Journal of Hepatology* 63 (2015): 743-752.

Volume 6 Issue 7 July 2023